

Palm-Sized Radiation Detector

The Los Alamos CZT Spectrometer



Los Alamos National Laboratory has developed a hand-held cadmium zinc telluride isotope detector capable of identifying gamma and neutron radiation emitted by radioactive materials. CZT is a semiconductor material that has the ability to detect various energy levels of radiation.

In real time, this device produces high-quality data in a portable unit that is not sensitive to extreme variations in temperature or environment. The detector hardware includes a CZT crystal housed within the preamplifier. The unit also has read-out electronics to conduct the measurements of any radioactive materials present and provide the analysis of those samples, using a microcomputer.

The detector was developed in Los Alamos' Advanced Nuclear Technology group (N-2), and has been deployed to the U.S. Department of Energy radiological response team members for advanced analysis of potentially radioactive items.

Using the detector, operators can identify whether a radiation source is near, how close that source is, what the radiation source is, what radioactive materials may be involved and how much of the material exists, based on the data collected by the detector and analyzed by an on-board microcomputer.

The CZT Spectrometer device uses a palmOne® personal digital assistant interface, with palmOne® REDEYE

software. REDEYE communicates with the microcomputer in the CZT spectrometer to control the operation of the CZT spectrometer. Three modes are currently available: a Search mode for detecting radiation, a Scan mode for locating the hot spot, and an Identification mode for determining the type of material. Additional modes, analysis or language options can be easily added to the system.

The CZT Spectrometer is completely self-contained in a waterproof, high-strength aluminum enclosure. Three batteries provide power to the system, providing 8–10 hours of continuous use.

The device improves upon status quo technology because it provides superior resolution and ease-of-use. The Los Alamos technology is more rugged than competing high-purity germanium detector technology because it is not sensitive to fluctuations to temperature as are conventional detectors.

Los Alamos is constantly exploring new and innovative methods of radiation detection. The effort to couple existing work in CdZnTe detector development with the palmOne® handheld solution was an incremental development time of six months. The total time to develop an expert system to automatically identify radionuclides based on CdZnTe detector technology was approximately three years.



A Los Alamos firefighter holds the latest in nuclear detection and identification tools, a handheld spectrometer with a Personal Digital Assistant (PDA) as the interface for quick uploading of technical data right from the field.



Los Alamos National Laboratory is operated by the University of California for the U.S. Department of Energy's National Nuclear Security Administration